Science, Service, Stewardship

DIPS, DPSs, and consideration of social structure: Hawai‘i false killer whales

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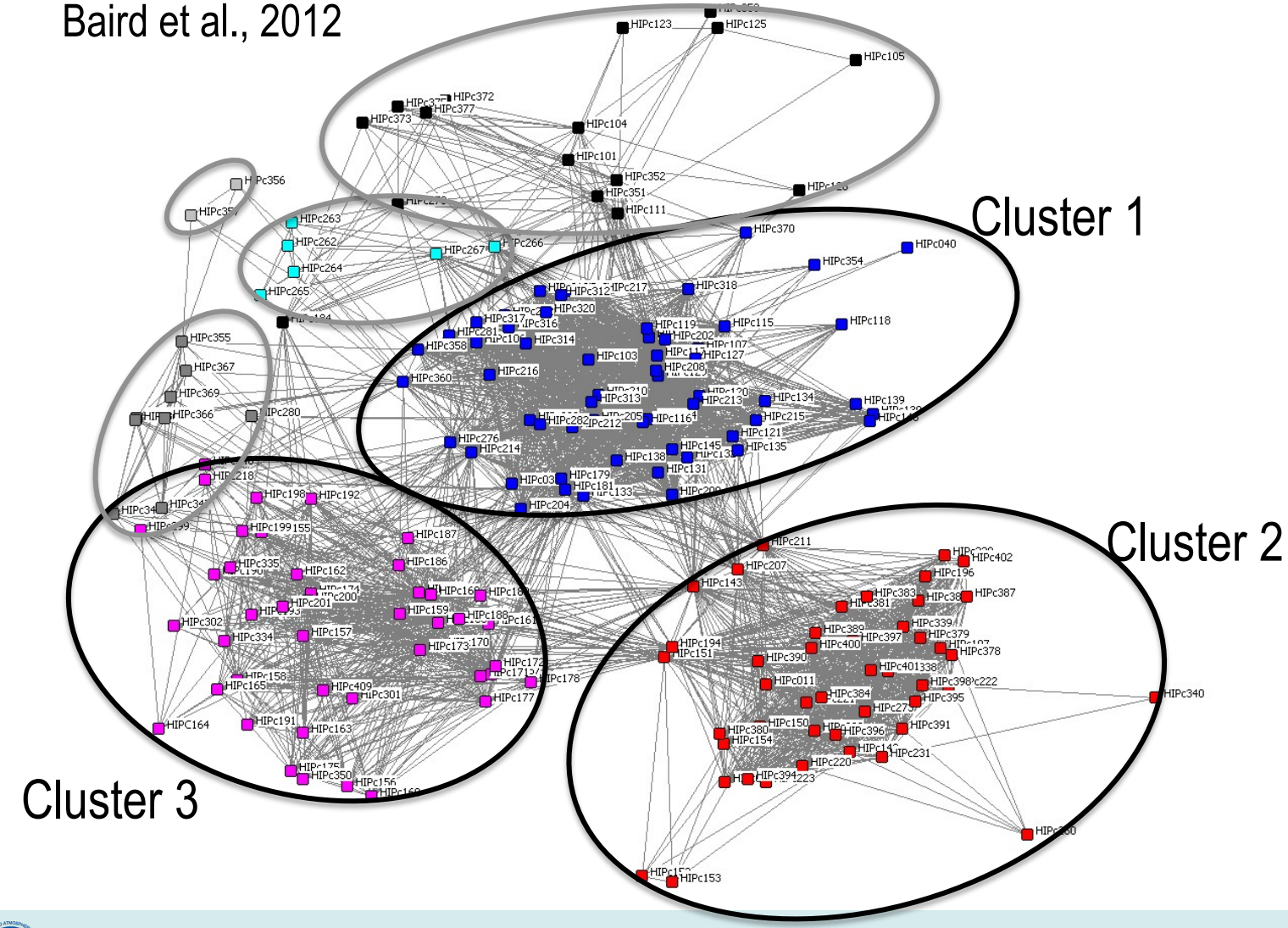
False Killer Whales

- Large tropical to sub-tropical Delphinid, usually seen far offshore
- Hawaiian Archipelago supports two island-associated populations
  - Main Hawaiian Islands (MHI) population, N=150
  - Northwest Hawaiian Islands (NWHI) population, N=562 (but highly uncertain)
  - Identified based on photo-identification and satellite tag data

Insular Population Social Network

Baird et al., 2012



Evidence of Decline

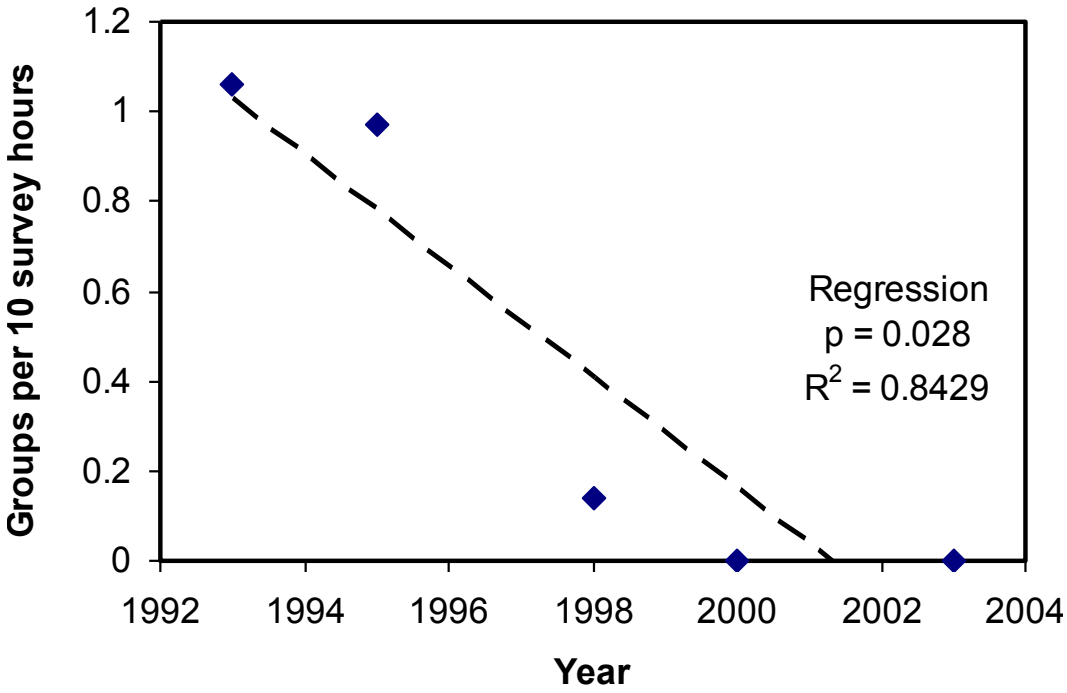
Largest group sighted in 1989 aerial survey: 470

(Leatherwood and Reeves, year)

Current abundance: <150

Mobley et al. aerial surveys

Feb-Apr 1993-2003



NMFS Petitioned to List under ESA

NRDC
THE EARTH'S BEST DEFENSE

A petition to list the insular population of Hawaiian false killer whale (*Pseudorca crassidens*) as endangered under the Endangered Species Act

Photo copyright Doug Perrine/ SeaPics.com

NOAA Technical Memorandum NMFS-PIFSC-22

August 2010

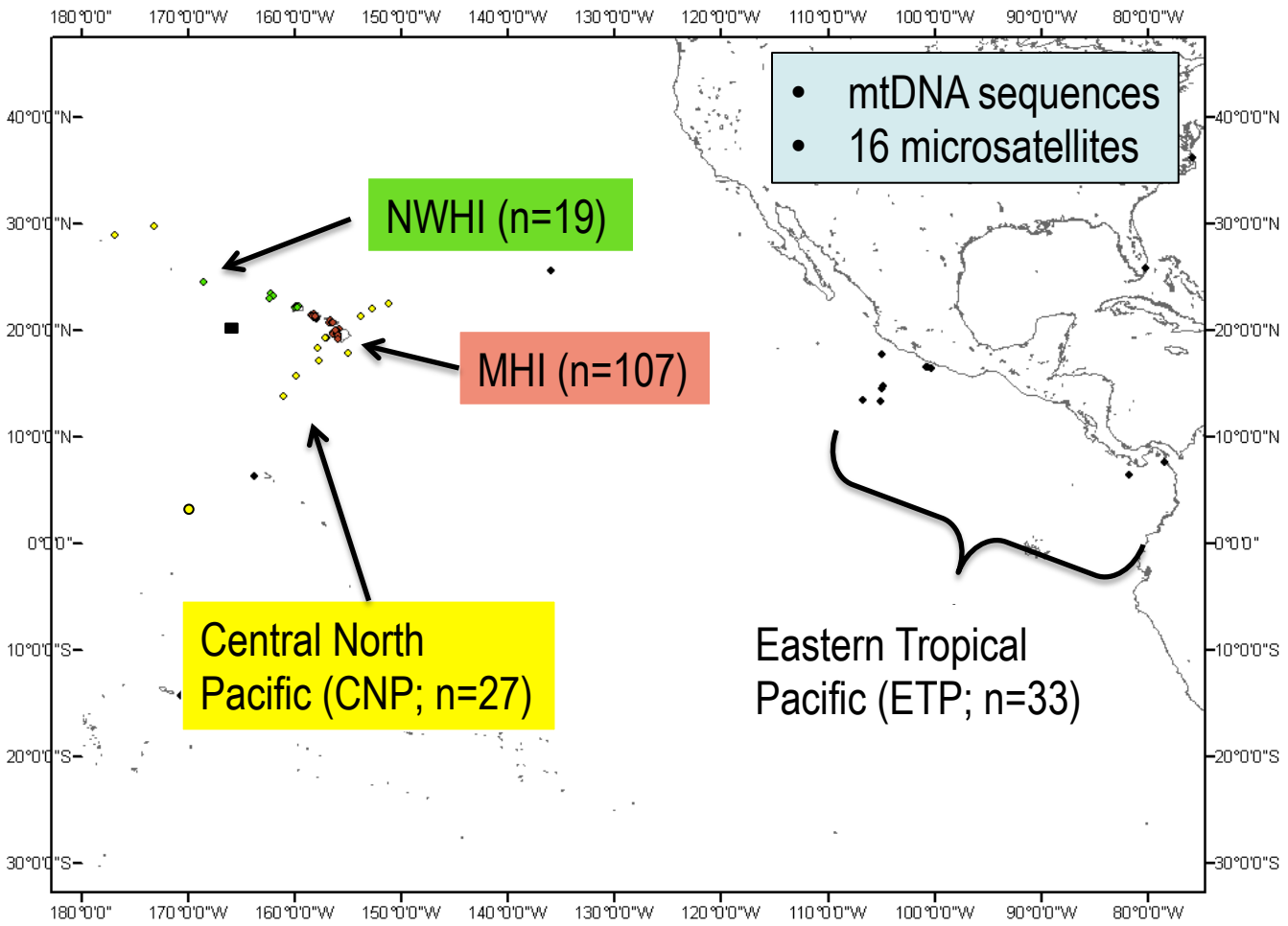
Status Review of Hawaiian Insular False Killer Whales (*Pseudorca crassidens*) under the Endangered Species Act

Erin M. Oleson, Christofer H. Boggs, Karin A. Forney, M. Bradley Hanson, Donald R. Kobayashi, Barbara L. Taylor, Paul R. Wade, and Gina M. Ylitalo

False Killer Whale Questions

- Are the MHI and NWHI populations demographically independent?
- Does the MHI population meet the criteria for a DPS?
- Do the two island-associated populations together meet the criteria for a DPS?

False Killer Whale Data Set



Population Differentiation

Estimate divergence with:

- mtDNA – Φ_{ST}
- nucDNA – F_{ST}

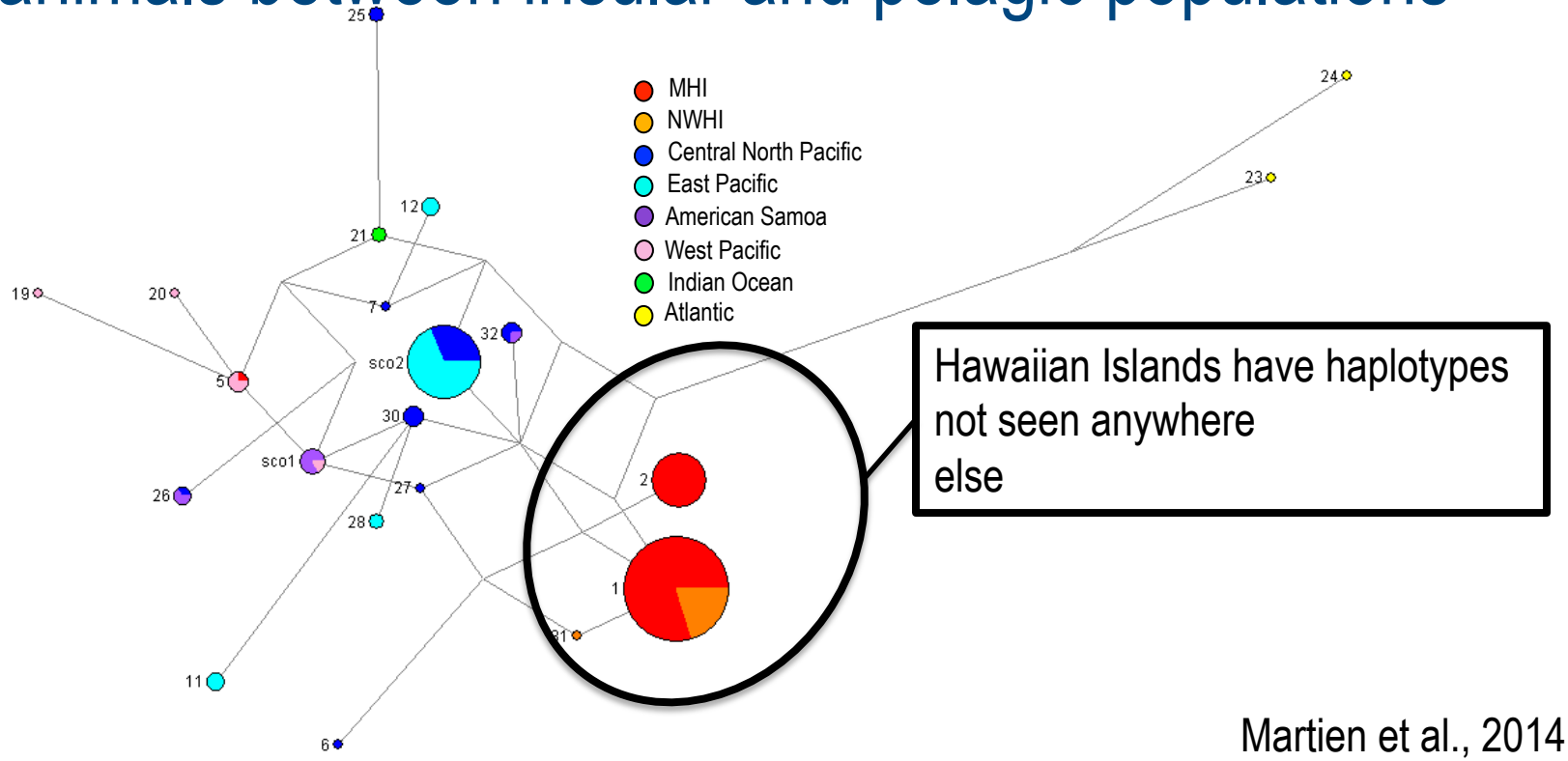
Assess significance with χ^2 permutation test

mtDNA – MHI and NWHI similar to each other, VERY different from CNP and ETP

nucDNA – MHI moderately different from all other strata

False Killer Whale Population Structure - mtDNA

- Mitochondrial haplotypes show no movement of animals between insular and pelagic populations



Martien et al., 2014

False Killer Whale Population Structure - nuclear

Bayesian clustering program STRUCTURE (Pritchard et al. 2000)

- Does not require *a priori* stratification
- Generates probabilistic assignments
- Varied number of groups (*k*) from 1 to 6

	Mean assignment to: Group 1	Group 2
MHI	85%	15%
NWHI, CNP, ETP	11%	89%

Suggests very little gene flow between MHI population and all other Pacific populations

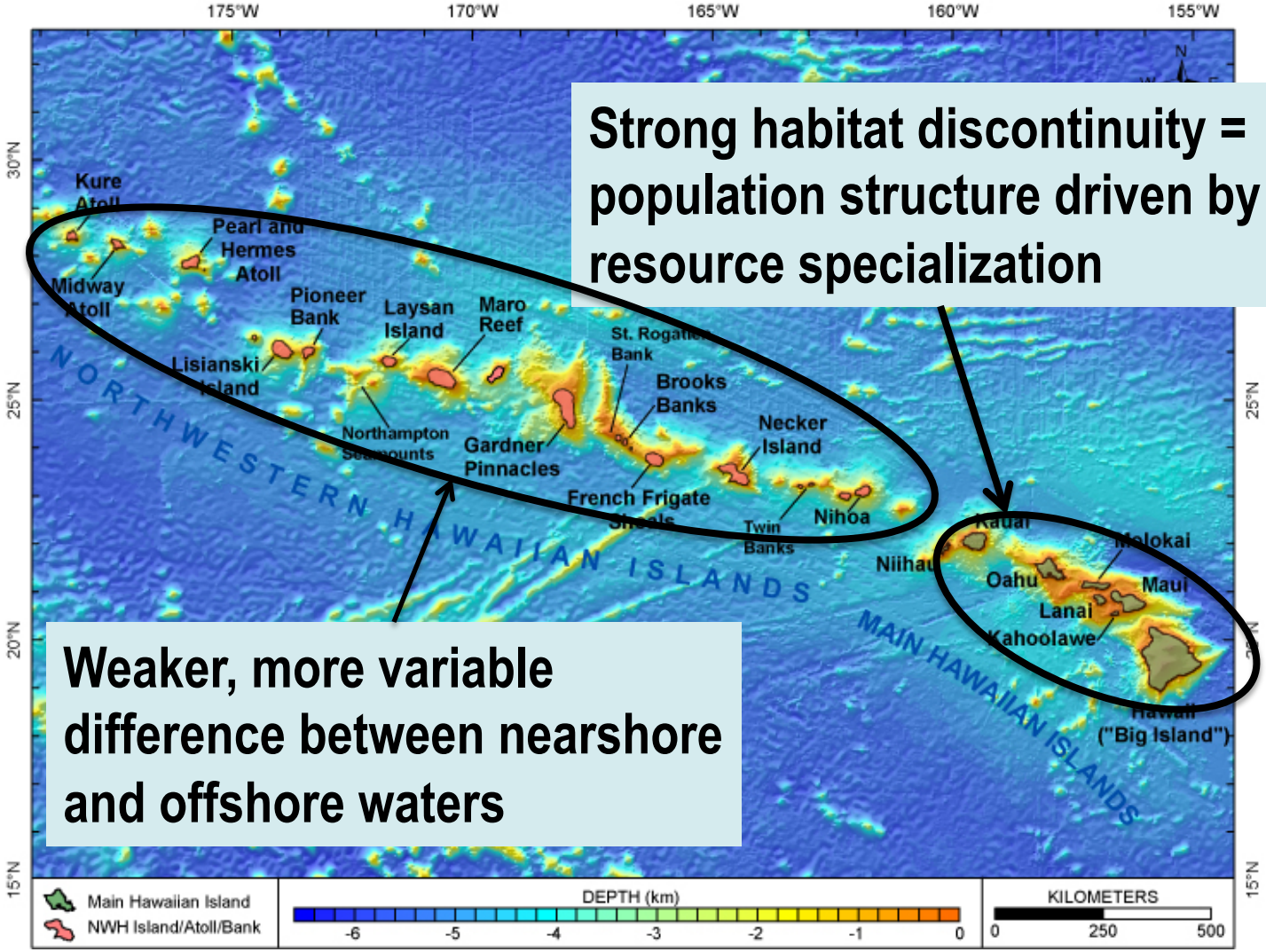
Martien et al., 2014

False Killer Whale Population Structure

Contrasting patterns in mtDNA vs. nuclear DNA:

- MHI and NWHI have shared ancestry
- NWHI has higher contemporary gene flow with pelagic animals than with MHI

Why is the MHI more distinct than the NWHI?



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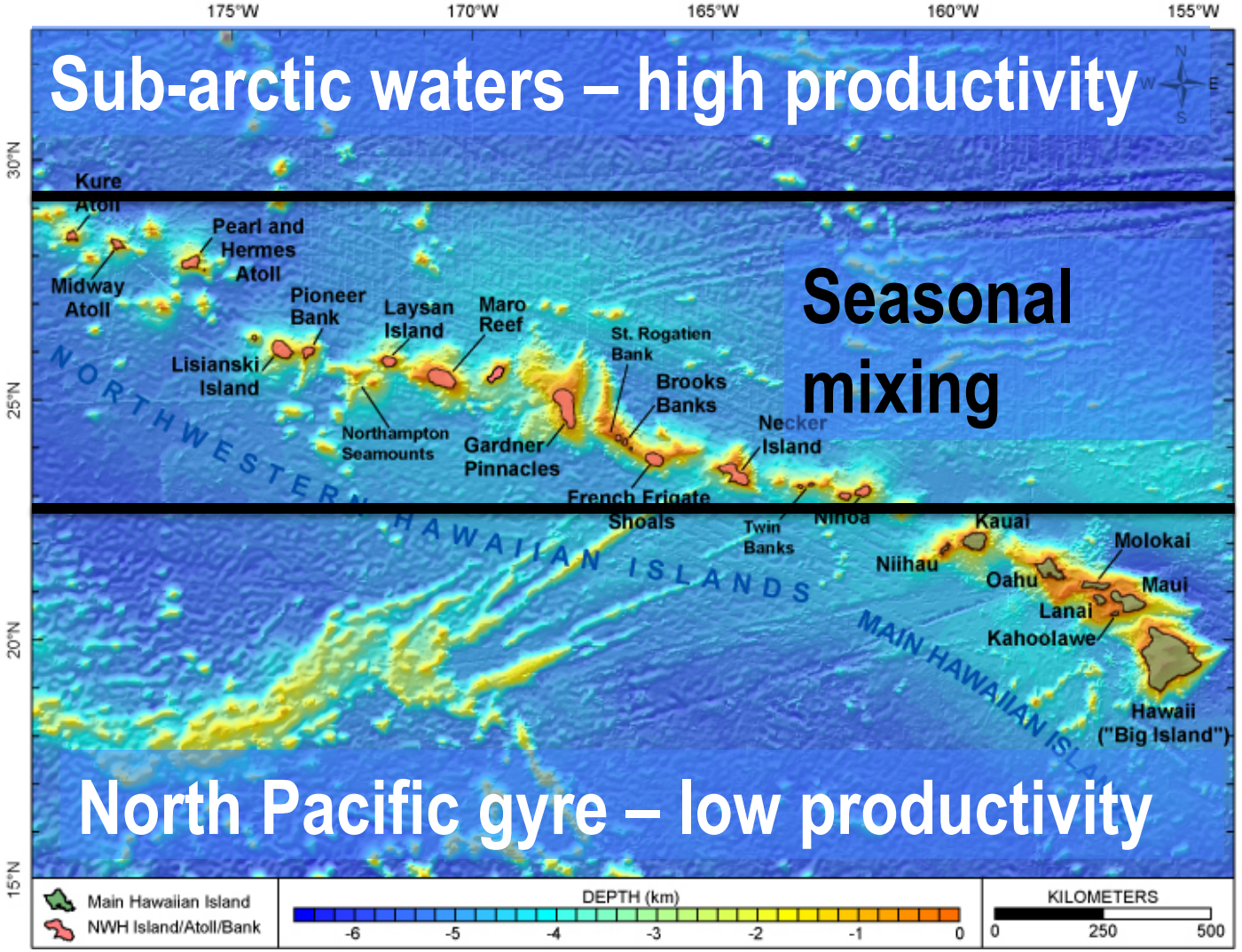
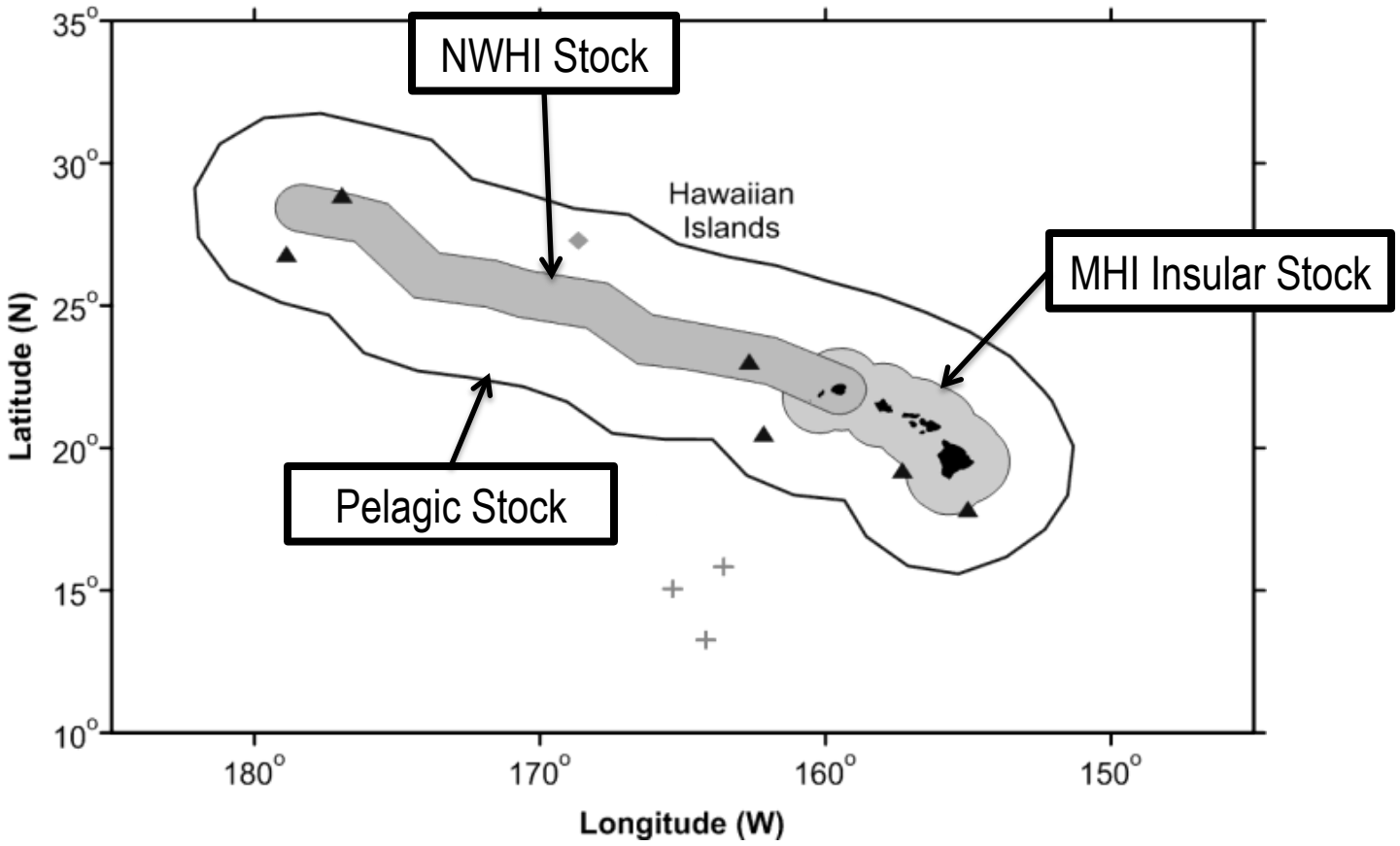


False Killer Whale UTCs



False Killer Whale UTCs